Assalamualaikum

Dear students

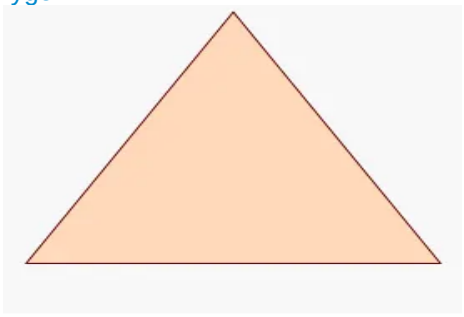
Here is your vacation H.W. for all the students of class 6 (Both section)

Topic: Basic concepts of Geometry

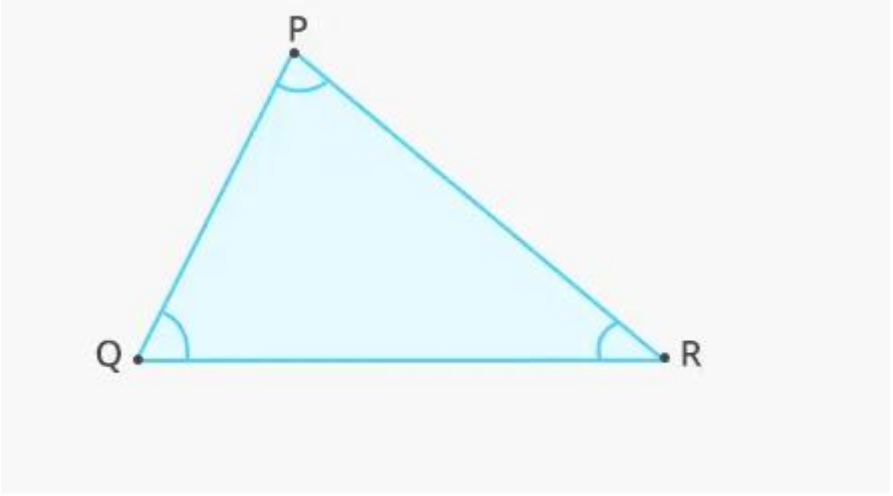
Chapter-6

What is a Triangle?

In geometry, a triangle is a closed, two-dimensional shape with three straight sides. A triangle is also a polygon.



Properties of a Triangle

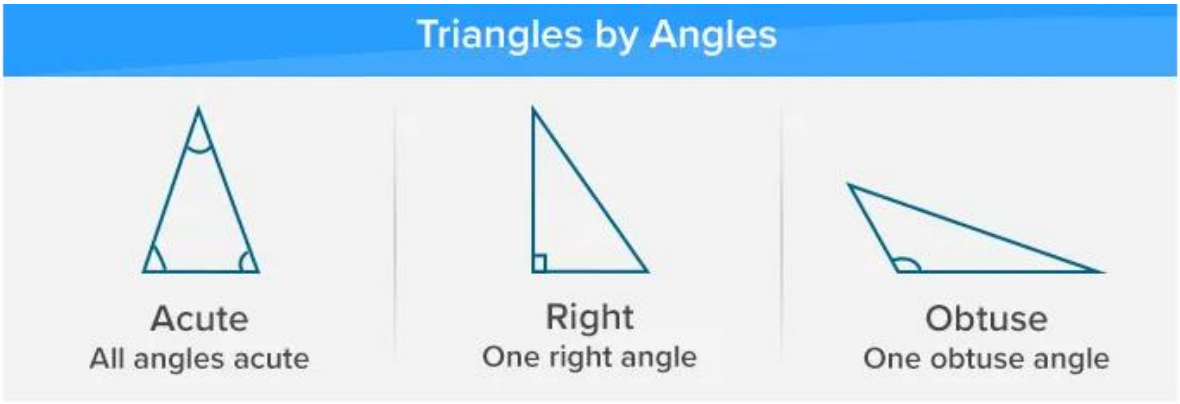


- A triangle has three sides three vertices, and three angles.
- The sum of the three interior angles of a triangle is always 180°.
- The sum of the length of two sides of a triangle is always greater than the length of the third side.
- A triangle with vertices P, Q, and R is denoted as △PQR.
- The area of a triangle is equal to half of the product of its base and height.

Different Types of Triangles

To classify triangles according to their angles, we measure each of its interior angles. Triangles can be classified by angles, as:

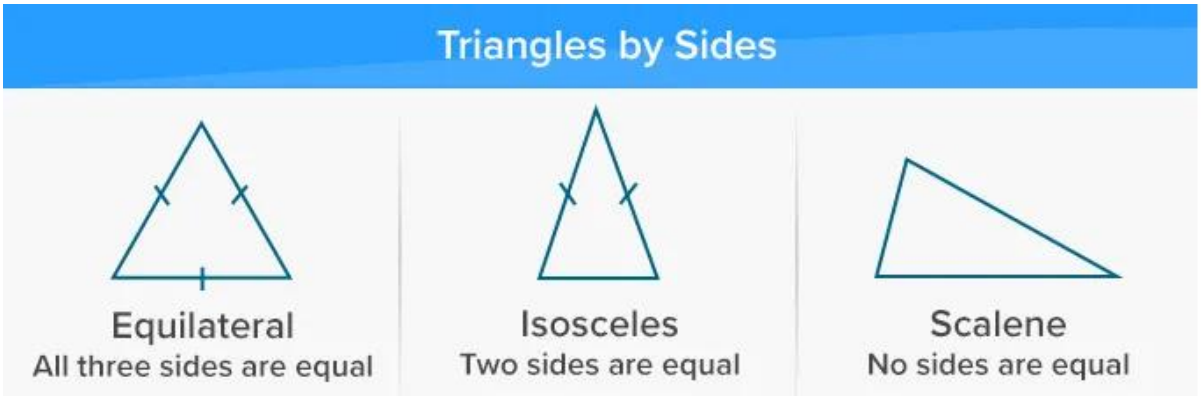
Acute Triangle	Right Triangle	Obtuse Triangle



An acute triangle has all interior angles acute (less than 90°), a right triangle has one right angle (equal to 90°) and an obtuse triangle has one obtuse angle (greater than 90°).

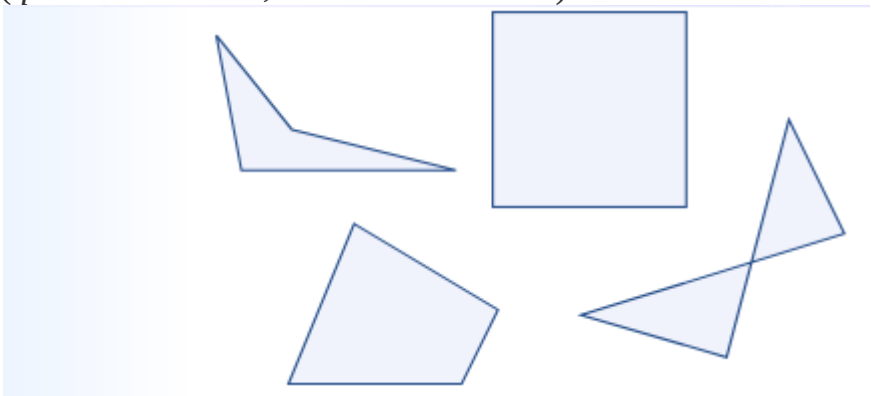
To classify the triangles according to their sides, we measure the length of each of its sides. Triangles can be classified by their sides, as:

Equilateral Triangle	Isosceles Triangle	Scalene Triangle



Quadrilaterals

Quadrilateral just means "four sides"
(*quad* means four, *lateral* means side).

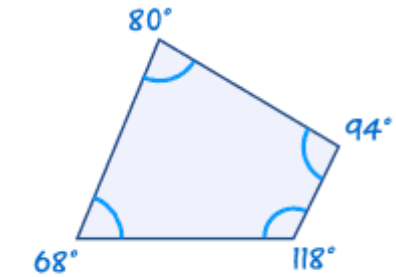


A Quadrilateral has four-sides, it is **2-dimensional** (a flat shape), **closed** (the lines join up), and has **straight** side

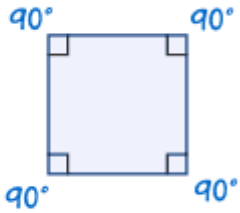
Properties

A quadrilateral has:

- four sides (edges)
- four vertices (corners)
- interior angles that add to **360 degrees**:



$68° + 118° + 94° + 80° = 360°$

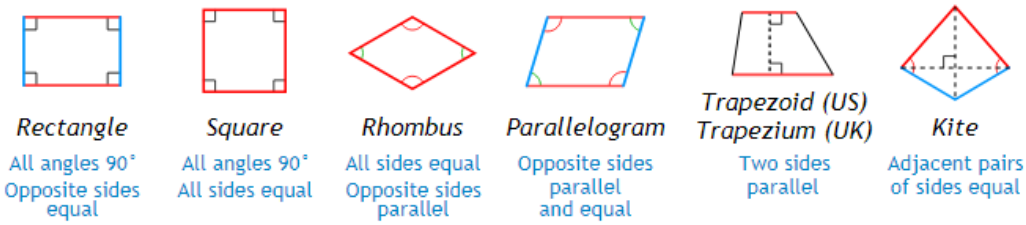


$4 \times 90° = 360°$

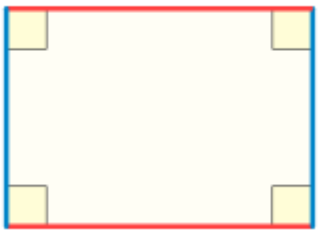
Try drawing a quadrilateral, and measure the angles. They should add to **360°**

Types of Quadrilaterals

There are special types of quadrilateral:



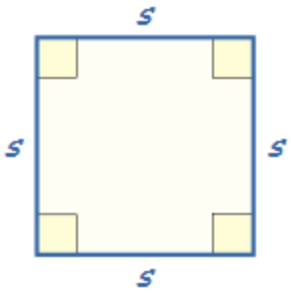
The Rectangle



A rectangle is a four-sided shape where every angle is a right angle (90°).

Also **opposite sides** are parallel and of equal length

The Square

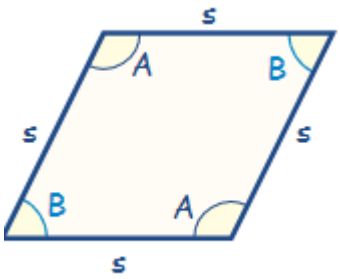


A square has equal sides (marked "s") and every angle is a right angle (90°)

Also opposite sides are parallel.

A square also fits the definition of a **rectangle** (all angles are 90°), and a **rhombus** (all sides are equal length)

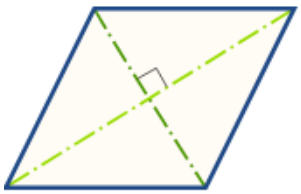
The Rhombus



A Rhombus is a four-sided shape where all sides have equal length (marked "s").

Also opposite sides are parallel *and* opposite angles are equal.

Another interesting thing is that the diagonals (dashed lines) meet in the middle at a right angle. In other words they "bisect" (cut in half) each other at right angles.



A rhombus is sometimes called a **rhomb** or a **diamond**.

The Parallelogram

A parallelogram has opposite sides parallel and equal in length. Also opposite angles are equal (angles "A" are the same, and angles "B" are the same).

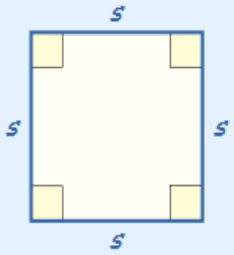
NOTE: Squares, Rectangles and Rhombuses are all Parallelograms

Example:

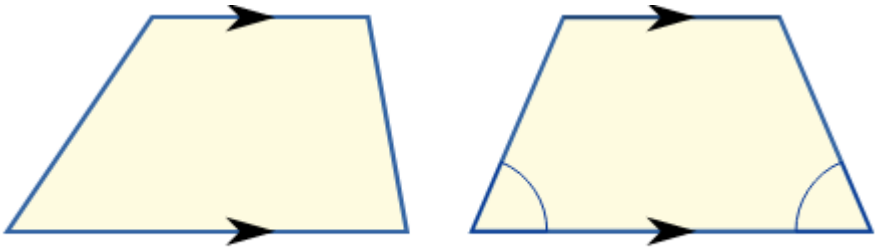
A **parallelogram** with:

- all sides equal and
- angles "A" and "B" as right angles

is a **square**!



The Trapezoid (UK: Trapezium)



Trapezoid Isosceles Trapezoid

A trapezoid *(called a trapezium in the UK)* has a pair of opposite sides parallel.

And a **trapezium** *(called a trapezoid in the UK)* is a quadrilateral with NO parallel sides:

Trapezoid Trapezium

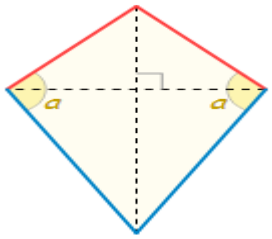
In the US:	a pair of parallel sides	NO parallel sides

In the UK:	NO parallel sides	a pair of parallel sides

(the US and UK definitions are swapped over!)

An **Isosceles** trapezoid, as shown above, has left and right sides of equal length that join to the base at equal angles

The Kite



Hey, it looks like a kite (usually).

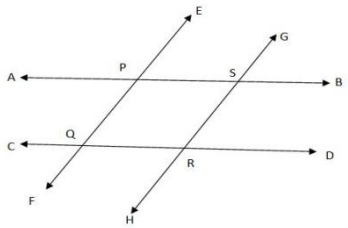
It has **two pairs** of sides:

Each pair is made of two equal-length sides that join up.

Also:

- the angles where the two pairs meet are equal.
- the diagonals, shown as dashed lines above, meet at a right angle.
- one of the diagonals *bisects* (cuts equally in half) the othe.
- **and that's it for the special quadrilaterals**

1. In the figure, $AB \parallel CD$ *and* $EF \parallel GH$.



a) Write down the name of the quadrilateral PQRS with reasons.
b) Taking four angles from the figure, find their supplementary angles and alternate angles.
c) Prove that, $< APE =< DRH$.

Solution-

a). As PQRS is a quadrilateral with four sides where opposite sides are parallel to each other .then PQRS can be called parallelogram.

b). In the figure four angles and their supplementary angles are determined

i. ∠APE and its supplementary angles ∠EPB

ii. . ∠ASG and its supplementary angles ∠BSG

iii. . ∠CQF and its supplementary angles ∠DQF

iv. . ∠DRH and its supplementary angles ∠HRC

As two angles are supplementary when they add up to 180 degrees

c). We know that, in a parallelogram the opposite angles are equal
$\therefore \angle QPS = \angle QRS$…….(i)

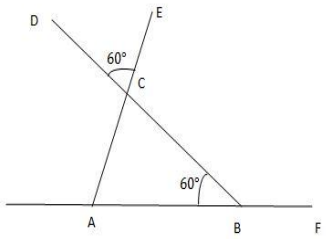
And$\angle PQR = \angle PSR$ … … … … … … … (ii)

We also know that $\angle QPS = \angle APE \; and \; \angle QRS = \angle DRH$ … … … … . (iii)

$[\because Vertically \; angles]$

From (i) and (ii) We can write $\angle APE = \angle DRH(Proved)$

2. In the adjacent diagram



a) What is the supplementary angle of $< ABC$?
b) What is the measurement of $< ACB$ and why ?
c) Prove That $< DCE + < ECB = 180°$.

SOLUTION 2 : (TRY YOURS SELF)

3. The lines AB and CD intersect at the point O .

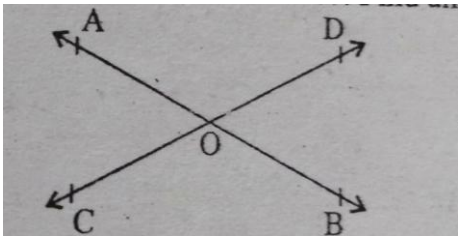
a). Based on the above information, draw a figure.

b). Prove that, the produced vertically opposite angles are equal to each other.

c). If ∠AOC = (4x – 16) and ∠ BOC = 2(x + 20), determine the value of x

Solution

a.



b). As per figure drawn in answer a angles∠ AOD and ∠BOC are vertical angles as well as ∠AOC and ∠BOD

We have to prove that ∠AOC=∠BOD and ∠=∠AOD

Proof:

CD intersects with the line OA at the poin O

∴ ∠AOD+∠AOC= 1 straight line ……..(i)

Again AB intersects with the line OD at the poin O

∴ ∠AOD+∠BOD= 1 straight line ……..(ii)

From (i) and (ii) we get,

∠AOD+∠AOC=∠AOD+∠BOD

Or, ∠AOC=∠AOD+∠BOD −∠AOD

Therefore,$\angle AOC = \angle BOD$

Similarly,$\angle BOC = \angle AOD$ (Proved)

c. Given that , ∠AOC $= (4x - 16) and$ ∠BOC=2(x+20)

Here,

∠AOC+∠BOC $= 180^0$

Or,4x−16+2(x+20) $= 180^0$

Or,4x−16+2x+40 $= 180^0$

Or,6x+24 = 180^0

Or,6x =180+24

Or,6x= 156

Or, x = $\frac{156}{6}$

So, x = 26(Ans)

Compiled by---

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